

WHAT IS CLAIMED IS:

1. A light emitting device comprising an organic light emitting element at least comprising:

a first layer comprising a first organic compound; and

a second layer comprising a second organic compound which is different from the first organic compound,

wherein a region comprising the first organic compound and the second organic compound between the first layer and the second layer.

2. A light emitting device according to claim 1, wherein a concentration of the first organic compound in the region declines toward the second layer from the first layer.

3. A light emitting device comprising an organic light emitting element at least comprising:

a first layer comprising a first organic compound; and

a second layer comprising a second organic compound which is different from the first organic compound,

wherein a mixed layer comprising the first organic compound and the second organic compound between the first layer and the second layer.

4. A light emitting device according to claim 3, wherein a concentration of the first organic compound in the mixed layer declines toward the second layer from the first layer.

5. A light emitting device comprising an organic light emitting element comprising:

a hole injecting layer comprising a first organic compound in contact with an anode;

and

a hole transporting layer comprising a second organic compound,

wherein a region comprising the first organic compound and second organic compound between the hole injecting layer and the hole transporting layer.

6. A light emitting device according to claim 5, wherein a concentration of the first organic compound in the region declines toward the hole transporting layer from the hole injection layer.

7. A light emitting device comprising an organic light emitting element comprising:

a hole injecting layer comprising a first organic compound in contact with an anode;

and

a hole transporting layer comprising a second organic compound,

wherein a mixed layer comprising the first organic compound and second organic compound between the hole injecting layer and the hole transporting layer.

8. A light emitting device according to claim 7, wherein a concentration of the first organic compound in the mixed layer declines toward the hole transporting layer from the hole injection layer.

9. A light emitting device comprising an organic light emitting element comprising:

an electron injecting layer comprising a first organic compound in contact with a cathode; and

an electron transporting layer comprising a second organic compound, wherein a region comprising the first organic compound and the second organic compound between the electron injection layer and the electron transporting layer.

10. A light emitting device according to claim 9, wherein a concentration of the first organic compound in the region declines toward the electron transporting layer from the electron injecting layer.

11. A light emitting device comprising an organic light emitting element comprising:
an electron injecting layer comprising a first organic compound in contact with a cathode; and
an electron transporting layer comprising a second organic compound, wherein a mixed layer comprising the first organic compound and the second organic compound between the electron injection layer and the electron transporting layer.

12. A light emitting device according to claim 11, wherein a concentration of the first organic compound in the mixed layer declines toward the electron transporting layer from the electron injecting layer.

13. A light emitting device comprising an organic light emitting element comprising:
a light emitting layer comprising a first organic compound; and
a hole transporting layer comprising a second organic compound, wherein a region comprising the first organic compound and the second organic compound between the light emitting layer and the hole transporting layer.

14. A light emitting device according to claim 13, wherein a concentration of the first organic compound in the region declines toward the hole transporting layer from the light emitting layer.

15. A light emitting device comprising an organic light emitting element comprising:
a light emitting layer comprising a first organic compound; and
a hole transporting layer comprising a second organic compound,
wherein a mixed layer comprising the first organic compound and the second organic compound between the light emitting layer and the hole transporting layer.

16. A light emitting device according to claim 15, wherein a concentration of the first organic compound in the mixed layer declines toward the hole transporting layer from the light emitting layer.

17. A light emitting device comprising an organic light emitting element comprising:
a light emitting layer comprising a first organic compound; and
an electron transporting layer comprising a second organic compound,
wherein a region comprising the first organic compound and the second organic compound between the light emitting layer and the electron transporting layer.

18. A light emitting device according to claim 17, wherein a concentration of the first organic compound in the region declines toward the electron transporting layer from the light emitting layer.

19. A light emitting device comprising an organic light emitting element comprising:
a light emitting layer comprising a first organic compound; and

an electron transporting layer comprising a second organic compound,
wherein a mixed layer comprising the first organic compound and the second organic
compound between the light emitting layer and the electron transporting layer.

20. A light emitting device according to claim 19, wherein a concentration of the first organic
compound in the mixed layer declines toward the electron transporting layer from the light emitting
layer.

21. A light emitting device comprising an organic light emitting element comprising:
a light emitting layer comprising a first organic compound;
a hole transporting layer comprising a second organic compound;
an electron transporting layer comprising a third organic compound;
a first region comprising the first organic compound and the second organic
compound between the light emitting layer and the hole transporting layer; and
a second region the second organic compound and the third organic compound
between the light emitting layer and the electron transporting layer.

22. A light emitting device according to claim 21,
wherein a first concentration of the first organic compound in the first region declines
toward the hole transporting layer from the light emitting layer, and
wherein a second concentration of the second organic compound in the second region
declines toward the electron transporting layer from the light emitting layer.

23. A light emitting device comprising an organic light emitting element comprising:

a light emitting layer comprising a first organic compound;
a hole transporting layer comprising a second organic compound;
an electron transporting layer comprising a third organic compound;
a first mixed layer comprising the first organic compound and the second organic compound between the light emitting layer and the hole transporting layer; and
a second mixed layer comprising the second organic compound and the third organic compound between the light emitting layer and the electron transporting layer.

24. A light emitting device according to claim 23,

wherein a first concentration of the first organic compound in the first mixed layer declines toward the hole transporting layer from the light emitting layer, and

wherein a second concentration of the second organic compound in the second mixed layer declines toward the electron transporting layer from the light emitting layer.

25. A light emitting device according to claim 21, wherein the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the first organic compound is smaller than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the second organic compound, and is smaller than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the third organic compound.

26. A light emitting device according to claim 23, wherein the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the first organic compound is smaller than the difference in energy between the highest occupied molecular

orbital and the lowest unoccupied molecular orbital of the second organic compound, and is smaller than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the third organic compound.

27. A light emitting device according to claim 21,

wherein the light emitting layer is comprising a host material and a light emitting material that has a smaller difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital than the host material, and

wherein the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the light emitting material is lower than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the second organic material, and is lower than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the third organic material.

28. A light emitting device according to claim 23,

wherein the light emitting layer is comprising a host material and a light emitting material that has a smaller difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital than the host material, and

wherein the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the light emitting material is lower than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the second organic material, and is lower than the difference in energy between the highest occupied molecular orbital and the lowest unoccupied molecular orbital of the third organic material.

29. A light emitting device according to claim 1, wherein the organic light emitting element emits light from a triplet excitation state.

30. A light emitting device according to claim 3, wherein the organic light emitting element emits light from a triplet excitation state.

31. A light emitting device according to claim 5, wherein the organic light emitting element emits light from a triplet excitation state.

32. A light emitting device according to claim 7, wherein the organic light emitting element emits light from a triplet excitation state.

33. A light emitting device according to claim 9, wherein the organic light emitting element emits light from a triplet excitation state.

34. A light emitting device according to claim 11, wherein the organic light emitting element emits light from a triplet excitation state.

35. A light emitting device according to claim 13, wherein the organic light emitting element emits light from a triplet excitation state.

36. A light emitting device according to claim 15, wherein the organic light emitting element emits light from a triplet excitation state.

37. A light emitting device according to claim 17, wherein the organic light emitting element emits light from a triplet excitation state.

38. A light emitting device according to claim 19, wherein the organic light emitting element emits light from a triplet excitation state.

39. A light emitting device according to claim 21, wherein the organic light emitting element emits light from a triplet excitation state.

40. A light emitting device according to claim 23, wherein the organic light emitting element emits light from a triplet excitation state.

41. An electronic appliance comprising a light emitting device according to claim 1.

42. An electronic appliance comprising a light emitting device according to claim 3.

43. An electronic appliance comprising a light emitting device according to claim 5.

44. An electronic appliance comprising a light emitting device according to claim 7.

45. An electronic appliance comprising a light emitting device according to claim 9.

46. An electronic appliance comprising a light emitting device according to claim 11.

47. An electronic appliance comprising a light emitting device according to claim 13.

48. An electronic appliance comprising a light emitting device according to claim 15.

49. An electronic appliance comprising a light emitting device according to claim 17.

50. An electronic appliance comprising a light emitting device according to claim 19.

51. An electronic appliance comprising a light emitting device according to claim 21.

52. An electronic appliance comprising a light emitting device according to claim 23.

53. A light emitting device comprising an organic light emitting element comprising an organic compound film interposed between an anode and a cathode,
wherein the organic compound film comprising a hole transporting material, an electron transporting material, and a light emitting material,
wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and
wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the light emitting material, the light emitting region comprises the light emitting material, the second mixed region comprises both the electron transporting material and the light emitting material, the electron transporting region

comprises the electron transporting material.

54. A light emitting device comprising an organic light emitting element comprising:

an organic compound film interposed between an anode and a cathode;

a hole injecting region in contact with the anode,

wherein the organic compound film comprising a hole transporting material, an electron transporting material, and a light emitting material,

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the light emitting material, the light emitting region comprises the light emitting material, the second mixed region comprises both the electron transporting material and the light emitting material, the electron transporting region comprises the electron transporting material.

55. A light emitting device comprising an organic light emitting element comprising:

an organic compound film interposed between an anode and a cathode; and

an electron injecting region in contact with the cathode,

wherein the organic compound film comprising a hole transporting material, an electron transporting material, and a light emitting material,

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are

connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the light emitting material, the light emitting region comprises the light emitting material, the second mixed region comprises both the electron transporting material and the light emitting material, the electron transporting region comprises the electron transporting material.

56. A light emitting device comprising an organic light emitting element comprising:

an organic compound film interposed between the anode and a cathode;

a hole injecting region in contact with the anode; and

an electron injecting region in contact with the cathode,

wherein the organic compound film comprising a hole transporting material, an electron transporting material, and a light emitting material,

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the light emitting material, the light emitting region comprises the light emitting material, the second mixed region comprises both the electron transporting material and the light emitting material, the electron transporting region comprises the electron transporting material.

57. A light emitting device comprising an organic light emitting element comprising:

an organic compound film interposed between an anode and a cathode,

wherein the organic compound film comprising a hole transporting material, an electron transporting material, a light emitting material, and a host material to the light emitting material

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the host material, the light emitting region comprises the host material doped with the light emitting material, the second mixed region comprises both the electron transporting material and the host material, the electron transporting region comprises the electron transporting material.

58. A light emitting device comprising an organic light emitting element comprising

an organic compound film interposed between an anode and a cathode; and

a hole injecting region in contact with the anode,

wherein the organic compound film comprising a hole transporting material, an electron transporting material, a light emitting material, and a host material to the light emitting material

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron

transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the host material, the light emitting region comprises the host material doped with the light emitting material, the second mixed region comprises both the electron transporting material and the host material, the electron transporting region comprises the electron transporting material.

59. A light emitting device comprising an organic light emitting element comprising

an organic compound film interposed between an anode and a cathode; and
an electron injecting region in contact with the cathode,

wherein the organic compound film comprising a hole transporting material, an electron transporting material, a light emitting material, and a host material to the light emitting material

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the host material, the light emitting region comprises the host material doped with the light emitting material, the second mixed region comprises both the electron transporting material and the host material, the electron transporting region comprises the electron transporting material.

60. A light emitting device comprising an organic light emitting element comprising

an organic compound film interposed between an anode and a cathode;
a hole injecting region in contact with the anode; and
an electron injecting region in contact with the cathode,
wherein the organic compound film comprising a hole transporting material, an electron transporting material, a light emitting material, and a host material to the light emitting material

wherein the organic compound film comprises a hole transporting region, a first mixed region, a light emitting region, a second mixed region, and an electron transporting region, that are connected in the order that the hole transporting region is nearest to the anode and the electron transporting region is nearest to the cathode, and

wherein the hole transporting region comprises the hole transporting material, the first mixed region comprises both the hole transporting material and the host material, the light emitting region comprises the host material doped with the light emitting material, the second mixed region comprises both the electron transporting material and the host material, the electron transporting region comprises the electron transporting material.

61. A light emitting device according to claim 54, wherein the hole injecting region comprises a conjugate system organic compound doped with Lewis acid.

62. A light emitting device according to claim 56, wherein the hole injecting region comprises a conjugate system organic compound doped with Lewis acid.

63. A light emitting device according to claim 58, wherein the hole injecting region comprises a conjugate system organic compound doped with Lewis acid.

64. A light emitting device according to claim 60, wherein the hole injecting region comprises a conjugate system organic compound doped with Lewis acid.

65. A light emitting device according to claim 61, wherein the conjugate system organic compound is a polymeric compound.

66. A light emitting device according to claim 62, wherein the conjugate system organic compound is a polymeric compound.

67. A light emitting device according to claim 63, wherein the conjugate system organic compound is a polymeric compound.

68. A light emitting device according to claim 64, wherein the conjugate system organic compound is a polymeric compound.

69. A light emitting device according to claim 61, wherein the Lewis acid is a compound comprising a halogen element.

70. A light emitting device according to claim 62, wherein the Lewis acid is a compound comprising a halogen element.

71. A light emitting device according to claim 63, wherein the Lewis acid is a compound comprising a halogen element.

72. A light emitting device according to claim 64, wherein the Lewis acid is a compound comprising a halogen element.

73. A light emitting device according to claim 55, wherein the electron injecting region is comprises a conjugate system organic compound doped with Lewis base.

74. A light emitting device according to claim 56, wherein the electron injecting region is comprises a conjugate system organic compound doped with Lewis base.

75. A light emitting device according to claim 59, wherein the electron injecting region is comprises a conjugate system organic compound doped with Lewis base.

76. A light emitting device according to claim 60, wherein the electron injecting region is comprises a conjugate system organic compound doped with Lewis base.

77. A light emitting device according to claim 73, wherein the Lewis base is a compound comprising an alkaline metal element.

78. A light emitting device according to claim 74, wherein the Lewis base is a compound comprising an alkaline metal element.

79. A light emitting device according to claim 75, wherein the Lewis base is a compound comprising an alkaline metal element.

80. A light emitting device according to claim 76, wherein the Lewis base is a compound comprising an alkaline metal element.

81. A light emitting device according to claim 53, wherein the organic light emitting element emits light from a triplet excitation state.

82. A light emitting device according to claim 54, wherein the organic light emitting element emits light from a triplet excitation state.

83. A light emitting device according to claim 55, wherein the organic light emitting element emits light from a triplet excitation state.

84. A light emitting device according to claim 56, wherein the organic light emitting element emits light from a triplet excitation state.

85. A light emitting device according to claim 57, wherein the organic light emitting element emits light from a triplet excitation state.

86. A light emitting device according to claim 58, wherein the organic light emitting element emits light from a triplet excitation state.

87. A light emitting device according to claim 59, wherein the organic light emitting element emits light from a triplet excitation state.

88. A light emitting device according to claim 60, wherein the organic light emitting element emits light from a triplet excitation state.

89. A light emitting device according to claim 53, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

90. A light emitting device according to claim 54, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

91. A light emitting device according to claim 55, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

92. A light emitting device according to claim 56, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

93. A light emitting device according to claim 57, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

94. A light emitting device according to claim 58, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

95. A light emitting device according to claim 59, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

96. A light emitting device according to claim 60, wherein at least one of the first mixed region and the second mixed region has concentration gradient.

97. An electric appliance comprising a light emitting device according to claim 53.

98. An electric appliance comprising a light emitting device according to claim 54.

99. An electric appliance comprising a light emitting device according to claim 55.

100. An electric appliance comprising a light emitting device according to claim 56.

101. An electric appliance comprising a light emitting device according to claim 57.

102. An electric appliance comprising a light emitting device according to claim 58.

103. An electric appliance comprising a light emitting device according to claim 59.

104. An electric appliance comprising a light emitting device according to claim 60.